6 Troubleshooting and Error List

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6.1 Possible faults and troubleshooting

There are five different faults which can occur with the 8000 IC/SC/NC:

6.1.1 INOP (total failure)
6.1.2 INOP (processor functioning)
6.1.3 ERROR (on display)
6.1.4 Sensor fault
6.1.5 Other faults which are not recognized by the processor system, e.g. no addition of moisture or defective touch-sensitive switches

6.1.1 INOP (total failure)

Definition: Incubator switches immediately to INOP on being activated

Possible faults: Processor system on the CPU PCB is not functioning or supply voltage is out of tolerance.

Troubleshooting: Check supply voltages; refer to 8.2.7.4 Power Pack PCB or watch LED on CPU PCB; refer to 8.2.5.2 or 8.2.5.3 CPU PCB

6.1.2 INOP (processor is functioning)

Definition: Hardware or software error which makes the operation impossible for technical or safety reasons. The error is stored in the fault list.

Troubleshooting:
a) Read out error list (see 6.2). Of particular importance are INOP errors detected during "operation".
b) Cancel error list.
c) Switch on device until it switches over to INOP.
d) Read out current error list and assess with INOP errors read out under a).

6.1.3 ERROR (Err on display)

Definition: There is errors present which only permits restricted operation of the incubator. The failed function is indicated in the appropriate module by "Err". The error is stored in the error list.

Troubleshooting: Read out and assess errors (see 6.2).

6.1.4 Sensor fault

Definition: Fault generated due to defective or non-connected sensors.
This also includes operator errors and sensor evaluation errors.

Troubleshooting: Read out and assess sensor errors (see 6.2).

6.1.5 Other faults

Definition: Faults, which are not recognized by the processor system.

Possible faults: Humidity supply defective:
- Temperature switch 135°C on water boiler tripped
- Solid state relay HLR2 of water heater defective
- Water heating element defective

Keypad defective:
- Fault in keypad
- Air Temperature Display PCB defective

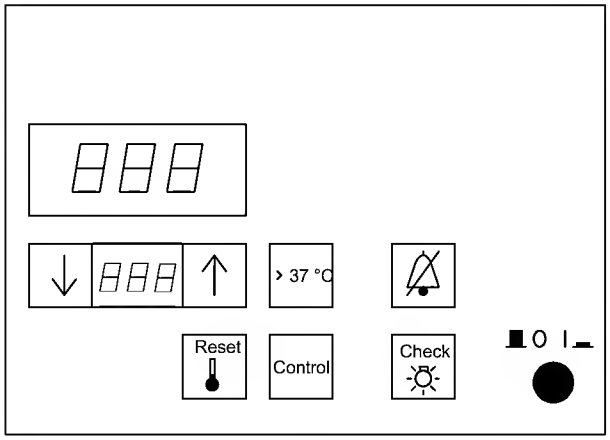
Troubleshooting: Humidity supply defective see 8.1.4 and 8.1.6
Keypad defective see 8.2.1 and 8.2.2

6.2 Error List

6.2.1 How to use the error list

6.2.1.1 Error list readout

- Switch off device.
- Simultaneously press keys "silence" and "down arrow key" for air temperature setting and in doing so switch on device.



- Keep both keys continuously pressed for approx. 5 seconds.
- An " F " appears on the air-temperature actual value display of the incubator. If a fault has been stored, the number will be output on the air-temperature set point display, " - - - " is the output if there are no stored faults.
- Further faults can be read out using the "up arrow key" for air temperature setting.
- The error list output is terminated by switching off the Incubator.

6.2.1.2 Erasure of Error List

- Call up Error List.
- Keep key "reset overtemperature" pressed and use the "up arrow key" for air temperature setting to erase the individual errors.

6.2.1.2 Explanatory notes on Error List

Errors detected during "operation": These are faults which are recognised by the processor system during operation of the incubator.

Errors detected in "10 min. test": A software-controlled check on the hardware of relevance to safety is carried out approx. 35 seconds after switching on the incubator, following power failure and every ten minutes.

Response with software versions 10.01, 10.02 and 20.00:

If a fault is detected, the device switches immediately to "INOP" or "ERROR".

Response as of software versions 10.03, 11.n, 20.01 and 21.n:

If a fault is detected, the “10 min. test” is repeated twice with a 5 second interval. The device does not switch to INOP or ERROR until the fault is detected on three consecutive occasions.

With all software versions it is possible in service mode (refer to 6.3) to perform a "10 min. test" with tighter tolerances.

6.2.2 Error List

Click on error number for viewing:

Err1	Err2	Err 3	Err4	Err6	Err7	Err8
Err9	Err10	Err11	Err12	Err13	Err14	Err15
Err16	Err17	Err19	Err20	Err21	Err22	Err24
Err25	Err26	Err27	Err28	Err29	Err30	Err32
Err33	Err34	Err35	Err36	Err37	Err38	Err39
Err40	Err41	Err42	Err43	Err44	Err45	Err46
Err47	Err48	Err49	Err50	Err51	Err52	Err53
Err54	Err55	Err56	Err57	Err58	Err59	Err60
Err61	Err63	Err64	Err65	Err66	Err67	Err68
Err69	Err70	Err71	Err72	Err73	Err74	Err75
Err76	Err77	Err78	Err79	Err80	Err81	Err82
Err83	Err84	Err85	Err86	Err87	Err88	Err89
Err90	Err91	Err92	Err93			

Error no.	Results in	When set	Description, cause and remedy
1	INOP	Operation	Timing error A/D conversion Fault detection: The AD converter has not completed conversion process after 33 ms; ready flag not reset in AD converter. Possible faults: - Program abort due to other fault - AD converter on Analog PCB defective Troubleshooting: - If other errors also present - ignore - If no other fault set, renew Analog PCB (see 8.2.6) back
2	INOP	Operation	Timing error A/D conversion Fault detection: Busy flag in AD converter erroneously set Possible faults: - Defective AD converter on Analog PCB - Bus error between PCB CPU and AD converter on Analog PCB. Troubleshooting: 1) Renew PCB Analog, see 8.2.6 2) If I) not successful: renew Motherboard PCB, see 8.2.8 3) If 1) and 2) not successful: renew CPU PCB, see 8.2.5. Other INOP errors would then also have to be present. back

Error no.	Results in	When set	Description, cause and remedy
3	Err-humidity	10-min-test	Control semiconductor relay H2O defective Fault detection: Semiconductor relay HLR2 of water heater in unit is actuated by transistor on Motherboard PCB and the actuation current passing through the semiconductor relay is then measured on the Motherboard PCB. Error is set if no current is measured with semiconductor relay actuated. Possible faults: - HLR2 actuation on Motherboard PCB defective - Current measurement on Motherboard PCB defective - Semiconductor relay HLR2 in heating unit defective - Relay K4 on heating unit defective, thus interrupting power supply to HLR2 - Ribbon cable between Motherboard PCB and heating unit defective Troubleshooting: 1) Check unit as per Section 8.1.8.8 2) No fault on unit: renew Motherboard PCB, see section 8.2.8 back

Error no.	Results in	When set	Description, cause and remedy
4	Err-skin	10-min-test	Skin-temperature sensor amplifier defective Fault detection: The skin-temperature sensor amplifier is switched in the course of the test by way of the relay K1 or via FETS (as of 1996) on the Analog PCB to the test resistance 36.0°C. The resultant measured value must be between 35.8°C and 36.2°C. Possible faults: - Relay K1 on Analog PCB defective - Skin-temperature sensor amplifier on Analog PCB defective - Actuator of relay K1 on Motherboard PCB or on Analog PCB defective Troubleshooting: 1) Check skin-temperature sensor amplifier as per Section 8.2.6.4. 2) If 1) not successful: renew relay K1 (order no. 18 13 714) or renew Analog PCB, see section 8.2.6 3) If 1) and 2) not successful: renew Motherboard PCB, see section 8.2.8 Note: Fault 4 has no significance in the case of devices which do not feature skin-temperature control. back

Error no.	Results in	When set	Description, cause and remedy
6	Sensor fault	Operation	Skin-temperature sensor defective Fault detection: Output voltage of skin-temperature amplifier on Analog PCB outside measuring range. Possible faults: - Skin-temperature sensor defective - Skin-temperature amplifier on Analog PCB defective - Cable connection between Analog PCB and skin-temperature sensor defective Troubleshooting: 1) Press key "check 36.0°C" in operation; display 36.0°C +/- 0.1°C. If correct value is displayed here, fault is to be found in skin-temperature sensor or in cable connection between Analog PCB and skin-temperature sensor. 2) If 1) not successful: check skin-temperature sensor amplifier as per Section 8.2.6.4 Note: Fault 6 is of no significance in the case of devices which do not feature skin-temperature control. back

Error no.	Results in	When set	Description, cause and remedy
7	INOP	Operation	Display actuation defective Fault detection: The display data for the PCBs for displaying the air temperature and the humidity/oxygen/skin temperature options are read into the RAM of the display and keypad drivers D1 on these PCBs and then read back. Error is set if the data read back do not tally with those previously written in. Possible faults: - One of the display and keypad drivers D1 on the PCBs Air Temperature Display, Skin-Temperature Display, Oxygen Display or Humidity Display is defective - Open circuit or short circuit on data lines from Motherboard PCB to PCBs Air Temperature Display, Skin-Temperature Display, Oxygen Display or Humidity Display. Troubleshooting: Remove PCBs for displaying skin temperature (if fitted). If fault 7 is then indicated during operation, the error is to be found on this PCB. If fault 7 is not displayed or there is no skin-temperature control option, exchange display/keypad driver D1 (order no. 18 20 877) in each case on PCBs for displaying air temperature and humidity/oxygen options and repeat test. Refer to Sections 8.2.2 - 8.2.4 for repair information. **back**

Error no.	Results in	When set	Description, cause and remedy
8	INPO	10-min-test	Control, water-heater semiconductor relay defective Fault detection: Water-heater semiconductor relay HLR2 in heating unit is switched off by actuation transistor on Motherboard PCB and the actuation current passing through the semiconductor relay is then measured on the Motherboard PCB. Error is set if current is measured despite the fact that semiconductor relay is not actuated. Possible faults: - HLR2 actuator on Motherboard PCB defective - Current measurement on Motherboard PCB defective Remedy: Renew Motherboard PCB, see section 8.2.8 back
9	INOP	10-min-test	Fan monitoring circuit defective Fault detection: During the test the fan monitoring circuit on the Motherboard PCB is checked by suppressing the pulses from the fan monitoring coil. Error is set if fan failure is not recognized in the test. Possible faults: - Fan monitoring circuit on PCB Motherboard defective - Circuit for suppressing fan pulses on PCB Motherboard defective Remedy: Renew Motherboard PCB, see Section 8.2.8. back

Error no.	Results in	When set	Description, cause and remedy
10	INOP	10-min-test	Air heating defective Fault detection: The air heating is switched on in the test and the current passing through the air heater is then measured. Error 10 is set if no current is measured although the heating is on. Possible faults: - Air-heating high impedance - Air-heater over temperature thermostat tripped - Relay K2, relay K4 or HLR1 defective - Relay actuation on Motherboard PCB defective - Heater monitoring circuit on Motherboard PCB defective - Current transformer on Unit PCB defective - Ribbon cable between PCB “motherboard” and unit defective - Troubleshooting: 1) Check unit as per Section 8.1.8.7; check ribbon cable whilst doing so 2) No fault on unit: renew PCB Motherboard, see Section 8.2.8 back

Error no.	Results in	When set	Description, cause and remedy
11	INOP	10-min-test	Air heating actuator defective Fault detection: The air heating is switched off in the test and the current passing through the air heater is then measured. Error 11 is set if current is measured although the heating is off. Possible faults: - HLR1 actuator on Motherboard PCB defective - Heater monitoring circuit on Motherboard PCB defective Semiconductor relay Troubleshooting: 1) Check unit as per Section 8.1.8.7 2) Fault not on heating unit: renew Motherboard PCB, see Section 8.2.8 back

Error no.	Results in	When set	Description, cause and remedy
12, 29	INOP	10-min-test	Safety shutdown defective Fault detection: The bistable relay K1 is switched in the course of the test to over temperature on the Motherboard PCB and at the same time the relay K3 of the valve (Incubator 8000 IC only) on the Unit PCB is actuated. The bistable relay interrupts the supply of power for the relay K2 on the Unit PCB, thus interrupting the power supply to the air heater. The relay K3 interrupts the power supply to the Valve (Incubator 8000 IC only). The processor then attempts to switch on the air heating and activate the valve. The following errors may be set: - Fault 12: impermissible current through air heating - Fault 29: impermissible current through valve Possible faults: Only fault 12 set: - Bistable relay KI on Motherboard PCB defective - Relay K2 on Unit PCB defective Only fault 29 set: - Relay K3 on Unit PCB defective Fault 12 and 29 set: - Actuation of safety shutdown on Motherboard PCB defective Troubleshooting: Only fault 12 set: 1) Check unit as per Section 8.1.8.7 2) Fault not on unit: Renew Motherboard PCB or relay K1 on Motherboard PCB, see 8.2.8 Only fault 29 set: - Check unit as per Section 8.1.8.6; whilst doing so also switch off valve with K3. Fault 12 and 29 set: - Renew Motherboard PCB, see 8.2.8 back

Error no.	Results in	When set	Description, cause and remedy
13	INOP	10-min-test	Air heating or monoflops defective Fault detection: The air heating is switched on in the test and monoflops 1 and 2 on the Motherboard PCB are re-triggered: following a waiting loop in the course of which the monoflops must not run down and switch off the heating, the current through the air heater is measured. Error 13 is set if current is not measured although the heating is on. Possible faults: As for error 10 and additionally: - Monoflop 1 and/or 2 on Motherboard PCB run down too soon Troubleshooting: 1) Check unit as per Section 8.1.8.7; check ribbon cable whilst doing so 2) Fault not on unit: Renew Motherboard PCB, see section 8.2.8 back
14	INOP	10-min-test	Safety shutdown for air heating defective Fault detection: The air heating is switched on in the test and the monoflop 1 on the Motherboard PCB is not re-triggered. After a waiting loop, the monoflop must run down and switch off the air heating. Error is set if current flows through the air heating following completion of the waiting loop. Possible faults: Safety shutdown for air heating via monoflop 1 on Motherboard PCB defective. Remedy: Renew Motherboard PCB see Section 8.2.8. back

Error no.	Results in	When set	Description, cause and remedy
15, 16, 17	INOP	10-min-test	Safety shutdown for heaters and valve defective Fault detection: Monoflop 2 on the Motherboard PCB is not m-triggered in the test. After a waiting loop the monoflop must run down and switch off the heaters and the valve. Following the waiting time it must not be possible to switch on the heaters and the valve. The following errors may be set: - Fault 15 - impermissible current through air heating - Fault 16 - impermissible current through semiconductor relay HLR2 of water heating - Fault 17 - impermissible current through the valve Possible faults: Safety shutdown via monoflop 2 on Motherboard PCB defective. Remedy: Renew Motherboard PCB, see section 8.2.8. Note: If air heating is defective, faults 16 or 17 may be set - pay attention to faults 10, 13 and 27. back

Error no.	Results in	When set	Description, cause and remedy
19, 65	INOP	10-min-test	A/D-converter voltage reference channel defective Fault detection: The reference channel on the Analog PCB is read out in the test. The following errors may be set: - Fault 19 - voltage greater than 4.79 V - Fault 65 - voltage less than 3.99 V Possible faults: - Voltage, reference channel on Analog PCB not within tolerance or not matched to voltage regulators for +15V or -15V - Voltage regulator for + 15V or -15 V on the Power Pack PCB outside tolerance or renewed Troubleshooting: 1) Check supply voltages as per section 6.3.2.11 and 8.2.7 2) If 1) OK: Calibrate A/D test channel as per Section 8.2.6 back
20	INOP	10-min-test	Safety shutdown via relay K4 defective Fault detection: The air heating is switched on in the test and the voltage monitoring comparator "upper limit 5 V" on the Motherboard PCB is checked. This comparator interrupts the power supply via relay K4 on the Unit PCB to the semiconductor relay HLR1 of the air heating. Error is set if current flowing through air heater is measured. Possible faults: See faults 21 - 24 Troubleshooting: See faults 21 . 24 back

Error no.	Results in	When set	Description, cause and remedy
21, 22, 24	INOP	10-min-test	Safety shutdown via relay K4 defective Fault detection: The heaters and the valve are switched on in the test and the voltage monitoring comparator "lower limit 5V" on the Motherboard PCB is checked. This comparator interrupts the power supply via the relay K4 on the Unit PCB to the semiconductor relays HLR1 and HLR2 of the heaters and the valve. The following errors may be set: - Fault 24 - impermissible current through air heater - Fault 21 - impermissible current through semiconductor relay HLR2 of water heater - Fault 22 - impermissible current through the valve Possible faults: - Fault 20 and (in some cases) faults 21, 22 and 24set: Relay K4 on unit defective. - Only fault 20 set or only faults 21 - 24: Comparator on Motherboard PCB defective. Troubleshooting: 1) Check relay K4 on unit as per section 8.1.8.5 2) If 1) OK: Renew Motherboard PCB, see section 8.2.8 **back**

Error no.	Results in	When set	Description, cause and remedy
25	INOP	10-min-test	Over temperature relay defective Fault detection: This test checks whether the air heating is deactivated in the event of over temperature. Error is set if there is an impermissible flow of current through the air heating. Possible faults: - Over temperature comparator on Analog PCB has not switched to overtemperature - Bistable relay K1 on Motherboard PCB defective - Relay K2 on Unit PCB defective Troubleshooting: 1) Check unit as per Section 8.1.8.7 2) No fault on unit: Check over temperature amplifier and over temperature comparator on Analog PCB as per section 8.2.6.4 3) Fault not on Unit PCB or Analog PCB: Renew bistable relay K1 on Motherboard PCB or renew Motherboard PCB back

Error no.	Results in	When set	Description, cause and remedy
26	INOP	10-min-test	Over temperature relay defective Fault detection: In the test the over temperature amplifier is switched via the relay K2 or via FETS (as of 1996) on the Analog PCB to the test resistance 40°C. The over temperature comparator on the Analog PCB must then switch and set the bistable relay K1 on the Motherboard PCB to over temperature. The second contact of the bistable relay is read in by way of a PIA port on the Motherboard PCB. Possible faults: - Relay K2 or FETS on Analog PCB defective - Over temperature comparator on Analog PCB defective - Bistable relay K1 on Motherboard PCB defective Troubleshooting: 1) Check over temperature amplifier and over temperature comparator on Analog PCB as per Section 8.2.6.4 2) If 1) OK: Renew relay K2 on Analog PCB, see 8.2.6 on onits up to 1995/1996 3) Fault not on Analog PCB: Renew bistable relay K1 on Motherboard PCB or renew Motherboard PCB, see 8.2.8 Note: In all probability the bistable relay K1 on the Motherboard PCB will be defective if faults 12, 29 (and 31) are additionally set. **back**

Error no.	Results in	When set	Description, cause and remedy
27	INOP	10-min-test	Air heating or overtemperature reset defective Fault detection: The bistable relay K1 on the Motherboard PCB has been set to overtemperature and is reset. The air heating is then switched on and the current passing through the air heating is measured. Error is set if there is no flow of current through the air heating. Possible faults: As for fault 10 and additionally bistable relay K1 on Motherboard PCB. Troubleshooting: As for fault 10. If fault is not to be found on unit, it is located in the bistable relay K1 or in its actuator on the Motherboard PCB back
28	INOP	10-min-test	Control of 02 valve defective Fault detection: The valve is switched off in the test and the current flowing through the valve is then measured. The error 28 may be set if there is impermissible current through the valve. Possible faults: - Valve actuation on Motherboard PCB defective - Current monitoring circuit on Motherboard PCB defective Troubleshooting: Renew Motherboard PCB, see Section 8.2.8 back
29	INOP	10-min-test	See error 12 (Err12)
30	INOP	10-min-test	See error 28 (Err28)

Error no.	Results in	When set	Description, cause and remedy
32	INOP	Operation	Air heating defective Fault detection: The air heating is switched on during operation and the current passing through the air heating is then measured. Fault 32 is set if no current is measured with the heating switched on. Possible faults: - High-impedance air heating - Overtemperature thermostat of air heating tripped - Relay K2, relay K4 or HLR1 on unit defective - Relay actuation on Motherboard PCB defective - Heater monitoring circuit on Motherboard PCB defective - Current transformer on Unit PCB defective - Ribbon cable between Motherboard PCB and unit defective - Voltage supply + 30 V on unit unstable due to defective charge capacitor Troubleshooting: 1) Check unit as per Section 9.1.8.7, check ribbon cable whilst doing so. 2) Fault not on unit: Renew Motherboard PCB, see section 8.2.8 **back**

Error no.	Results in	When set	Description, cause and remedy
33	INOP	Operation	Air heating control defective Fault detection: The air heating is switched off during operation and the current passing through the air heating is then measured. Fault 33 is set if current is measured with the heating switched off. Possible faults: - Semiconductor relay HLRI for air heating on unit defective - HLRI actuation on Motherboard PCB defective - Heater monitoring circuit on Motherboard PCB defective Troubleshooting: 1) Check unit as per Section 8.1.8.7 2) Fault not on unit: Renew Motherboard PCB, see section 8.2.8 back
34	INOP	Operation	Control of 0_2 valve defective Fault detection: The valve is switched off during operation and the flow of current through the valve is then measured on the Motherboard PCB. Possible faults: - Valve actuation on Motherboard PCB defective - Current monitoring circuit on Motherboard PCB defective Troubleshooting: Renew Motherboard PCB, see Section 8.2.8 back

Error no.	Results in	When set	Description, cause and remedy
35, 38	INOP	Operation	Control of water-heating semiconductor relay defective Fault detection: The water-heating semiconductor relay HLR2 in the unit is switched on and off during operation by the actuation transistor on the Motherboard PCB and the actuation current passing through the semiconductor relay on the Motherboard PCB is then measured. Error 35 is set if current is measured although semiconductor relay is not actuated. Error 38 is set if current is not measured although semiconductor relay is actuated. Possible faults: - HLR2 actuation on Motherboard PCB defective - Current measurement on Motherboard PCB defective Remedy: Renew Motherboard PCB, see Section 8.2.8 back

Error no.	Results in	When set	Description, cause and remedy
36	Fan failure	Operation	Fan fault Fault detection: The speed of the fan is monitored during operation. Error is set if speed drops off by 50 %. Possible faults: - Impeller not attached - Impeller not properly secured, not turning - Fan motor defective - Voltage supply for fan motor defective Troubleshooting: 1) Fan motor not turning: Check voltage supply on unit as per section 8.1.8.3 and in particular fuse F8 2) If 1) OK: Check fan monitoring on unit as per section 8.1.8.4. Note: Pay attention to possible faults relating to "inadequate voltage". 3) If 1) and 2) OK: Renew Motherboard PCB, see section 8.2.8 **back**
37	INOP	Operation	Multiplexer addressing defective Fault detection: The addressing of the multiplexer is monitored on the Analog PCB in the course of operation. Possible faults: - Addressing or feedback on Analog PCB defective - Output of addressing or read-in of feedback on Motherboard PCB defective Troubleshooting: 1) Renew Analog PCB, see section 8.2.6 2) If 1) not successful: Renew Motherboard PCB, see section 8.2.8 **back**
38	Err-humidity	Operation	See error 35 (**Err35**)

Error no.	Results in	When set	Description, cause and remedy
39	Err-O2	Operation	Control of 0_2 valve defective Fault detection: The valve is switched on during operation and the flow of current through the valve is then measured. Error is set if there is no flow of current. Possible faults: - Valve not connected on Unit PCB - Valve actuation on Motherboard PCB defective - Current monitoring circuit on Motherboard PCB defective - Relay K3 on Unit PCB defective Troubleshooting: 1) Check connection of valve on Unit PCB Note: The same connector is to be found on Analog PCB up to 1995/1996 1) If 1) OK: Check unit as per Sections 8.1.8.6 and 6.1.8.10 2) If 1) and 2) OK: Renew Motherboard PCB, see section 8.2.8 **back**
40	Sensor fault	Operation	02 amplifier defective Fault detection: The output voltage of the 0_2 amplifier 1 corresponds to an 0_2 sensor voltage greater than/equal to 25 mV. Possible faults: O_2 amplifier 1 on Analog PCB defective Troubleshooting: Check O_2 inputs as per Section 8.2.6.4 **back**

Error no.	Results in	When set	Description, cause and remedy
41	Sensor fault	Operation	0_2 sensors defective Fault detection: The calculated 0_2 concentrations of the two 0_2 sensors are compared in the course of operation. This error is set if the two values do not tally. Possible faults: One or both 0_2 sensors defective (linearity error) Remedy: Renew 0_2 sensors back
42	Sensor fault	Operation	0_2 calibration defective Fault detection: Calibration terminated on account of voltage fluctuations by 0_2 sensors. Possible faults: 0_2 concentration not stable, due for example to leakage between climate sensor and hood. back

Error no.	Results in	When set	Description, cause and remedy
43	Sensor fault	Operation	0_2 sensor(s) not fitted Fault detection: One or both 0_2 sensor voltages less than/equal to 3 mV Possible faults: - Climate sensor not connected - One or both 0_2 sensors not fitted - Open circuit in lead between sensor(s) and Analog PCB - 0_2 amplifier on Analog PCB defective Troubleshooting: 1) Check whether sensors fitted 2) If 1) OK: Check 0_2 inputs as per Section 8.2.6.4 **back**

Error no.	Results in	When set	Description, cause and remedy
44	Sensor fault	Operation	Air temperature sensor defective or not inserted Fault detection: Voltage from air temperature amplifier on Analog PCB too low (below normal temperature range). Possible faults: - Sensor not connected - Break in cable in sensor or in cable from back wall to Analog PCB - Analog PCB defective Troubleshooting: - Sensor connected? - Are temperature values displayed in service mode? - Check Analog PCB as per section 8.2.6 - Note: Climate sensor of Incubator 8000 IC may also be connected directly on Analog PCB. **back**
45	Sensor fault	Operation	Humidity sensor defective Fault detection: Output voltage of humidity sensor (measured on Analog PCB) is outside permitted voltage range. Possible faults: - Humidity measurement in climate sensor defective - Analog PCB defective Troubleshooting: Connect up sensor simulator, Incubator 8000 (P/N 79 01 240) instead of climate sensor. The displayed humidity values should be complied with to +/- 6 % relative. The 12 VDC voltage supply from the Analog PCB can be checked on the simulator. Set value = 12 to 13V. Refer to 8.3 Climate sensor for further repair information. **back**

Error no.	Results in	When set	Description, cause and remedy
46	Sensor fault	Operation	Excessive temperature difference Fault detection: Difference between temperature and over temperature sensor (measured by Analog PCB) is in excess of 0.4°C. Possible faults: - Temperature amplifiers for these sensors on Analog PCB have drifted - Sensor drift (not likely) Troubleshooting: Check Analog PCB as per Section 8.2.6. If no sensor simulator, Incubator 8000 (P/N 79 01 240) is available, the two temperature values are to be compared in service modes 4 and 5. The maximum permissible deviation is 0.3°C over the entire temperature range between 20°C and 40°C. back
47	Err-skin	10-min test	Relay K1 on Analog PCB defective Fault detection: The measured value of the skin-temperature channel must change within 20 minutes. If this is not the case, the switching contact in relay K1 on the Analog PCB (on units up to 1995/1996) is sticking or the contact surface of the sensor is positioned on an object with a large thermal mass. Possible faults: Relay K1 on Analog PCB defective, see 8.2.6 Remedy: Renew relay K1 on Analog PCB or renew Analog PCB, see 8.2.6 back

Error no.	Results in	When set	Description, cause and remedy
48	Lack of water	Operation	Lack of water Fault detection: Temperature of 135°C at boiler has been exceeded. This is not a fault if there is no water in the boiler. Possible faults: - Water-shortage thermo switch switching too soon - Kinked water hose Remedy: If the hose is OK, renew the water-shortage warning switch (see 8.1.4). **back**
49,50	INOP	Operation	Program sequence defective Fault detection: Plausibility checks are made in the course of the normal program sequence. Possible faults: - Program abort due to other INOP errors - CPU PCB defective Remedy: If these errors do not occur together with other INOP errors, renew CPU PCB (see 8.2.5) **back**

Error no.	Results in	When set	Description, cause and remedy
51	INOP	Operation	ROM error CPU PCB Fault detection: Fault in ROM test Possible faults: - EPROM on CPU PCB defective - CPU PCB defective Remedy: 1) Renew EPROM on CPU PCB, see 8.2.5 2) If 1) not successful: renew CPU PCB, see 8.2.5 back
52	INOP	Operation	RAM error CPU PCB Fault detection: Fault in RAM test Possible faults: - RAM on CPU PCB defective - CPU PCB defective Remedy: 1) Renew TK-RAM 18 28 142 on CPU PCB, see 8.2.5 2) If 1) not successful: renew CPU PCB, see 8.2.5 back

Error no.	Results in	When set	Description, cause and remedy
53	INOP	Operation	PIAs on Motherboard PCB defective Fault detection: PIA D1 and/or D2 on Motherboard PCB cannot be initialized after switch-on. Possible faults: - PIAs on Motherboard PCB defective - Motherboard PCB defective Remedy: 1) Renew both PIAs on Motherboard PCB, see 8.2.8 2) If 1) not successful: renew Motherboard PCB, see 8.2.8 back
54	INOP	Operation	Timer on CPU PCB defective Fault detection: The timing of timer D13 on the CPU PCB is monitored. Possible faults: - Jumper in position X6 not correct - Timer on CPU PCB defective - CPU PCB defective Remedy: 1) Check position of jumper on CPU PCB, see 8.2.5 2) if 1) not successful: Renew timer D13 on CPU PCB, see 8.2.5 3) if 1) and 2) not successful: renew CPU PCB, see 8.2.5 back

Error no.	Results in	When set	Description, cause and remedy
55	INOP	Operation	Program sequence defective Fault detection: Plausibility checks are performed in the course of the normal program sequence. Possible faults: - Program abort due to other INOP errors - CPU PCB defective Remedy: If these faults do not occur together with other INOP errors, renew CPU PCB, see 8.2.5 back
56	INOP	Operation	RAM error CPU PCB Fault detection: Fault in RAM test Possible faults: - RAM on CPU PCB defective - CPU PCB defective Remedy: 1) Renew TK-RAM 15 25 142 on CPU PCB, see 8.2.5 2) If 1) not successful: Renew CPU PCB, see 8.2.5 back

Error no.	Results in	When set	Description, cause and remedy
57	Sensor fault	Operation	Air temperature sensor defective Fault detection: Short circuit in air temperature sensor. Possible faults: - Short circuit in sensor - Short circuit in connecting cable between jack on back and Analog PCB - Analog PCB defective Troubleshooting: - Are temperature values indicated in service mode? - Check Analog PCB as per section 8.2.6 - Note: Climate sensor of Incubator 8000 IC may also be directly connected in test on Analog PCB back
58	Sensor fault	Operation	Skin temperature sensor defective Fault detection: Voltage from skin temperature amplifier on Analog PCB too low (below normal temperature range). Possible faults: - Sensor not connected or defective - Break in cable in sensor or in cable from back wall to Analog PCB - Analog PCB defective (measurement or identifier “sensor connected”) Troubleshooting: - Sensor connected or defective? - Is temperature value indicated on pressing key “Check 36.0°C"? - Check Analog PCB as per section 8.2.6 back

Error no.	Results in	When set	Description, cause and remedy
59	Sensor fault	Operation	0_2 sensor A used up Fault detection: 0_2 voltage of capsule A less than 9.5mV, measured on Analog PCB. Possible faults: - 0_2 sensor A used up - Break in cable between sensor and Analog PCB - Analog PCB defective Remedy: Renew 02 sensor Troubleshooting: Only if renewing 0_2 sensor unsuccessful: Check Analog PCB as per section 8.2.6 **back**
60	Sensor fault	Operation	02 amplifier defective Fault detection: Output voltage of 0_2 amplifier corresponds to 0_2 sensor voltage greater 25 mV. Possible faults: 0_2 amplifier 2 on Analog PCB defective Troubleshooting: Check 0_2 inputs as Section per 6.2.6.4 **back**

Error no.	Results in	When set	Description, cause and remedy
61	Sensor fault	Operation	0_2 sensor B used up Fault detection: 0_2 voltage of capsule B less than 9.5mV, measured on Analog PCB. Possible faults: - 0_2 sensor B used up - Break in cable between sensor and Analog PCB - Analog PCB defective Remedy: Renew 0_2 sensor Troubleshooting: Only if renewing 0_2 sensor unsuccessful: Check Analog PCB .” as per section 8.2.6 **back**
63, 64	INOP	Operation	ROM error CPU PCB Fault detection: Fault in ROM test Possible faults: - EPROM on CPU PCB defective - CPU PCB defective Remedy: 1) Renew EPROM on CPU PCU, see 8.2.5 2) If 1) not successful: renew CPU PCB, see 8.2.5 **back**
65	INOP	10-min-test	A/D-converter voltage reference channel defective See error 19 (**Err19**) **back**

Error no.	Results in	When set	Description, cause and remedy
66	INOP	Operation	Standby switch defective Fault detection: Auxiliary contact of standby switch open in operation. Possible faults: - Standby switch defective - PIA D2 (port 7) on Motherboard PCB defective Remedy: 1) Renew PCB “switch”, see 8.2.9 2) If 1) not successful: renew PIA D2 on Motherboard PCB, see 8.2.8 3) If 1) and 2) not successful: Renew Motherboard PCB, see 8.2.8 back
67	INOP	Operation	0_2 valve defective Fault detection: Following switch-off of 0_2 module, the 0_2 concentration is monitored for a further three minutes. INOP is given if the 02 concentration increases during this time by more than 3 % by volume. Possible faults: - 0_2 valve defective (open) - External introduction of 0_2 into Incubator Remedy: Only if no oxygen introduced into Incubator: Renew valve. back

Error no.	Results in	When set	Description, cause and remedy
68	INOP	Operation	Key "plus air temperature" sticking Fault detection: During operation key recognized as having been pressed for more than 30 seconds, thus giving grounds for assumption that key is defective. Possible faults: - Keypad defective - Air Temperature Display PCB defective - Key pressed for too long a period Remedy: 1) Renew keypad, see 8.2.1 2) If 1) not successful: renew Air Temperature Display PCB, see 8.2.2 **back**
69	INOP	Operation	Key "minus air temperature" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
70	No effect	Operation	Key "control air temperature" sticking Fault detection, possible faults and remedy: See error 66 **back**
71	No effect	Operation	Key "> 37°C" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
72	No effect	Operation	Key "reset over temperature" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**

Error no.	Results in	When set	Description, cause and remedy
73	INOP	Operation	Key "silence" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
74	No effect	Operation	Key "check lamps" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
75	Err-skin	Operation	Key "plus skin temperature" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
76	Err-skin	Operation	Key "minus skin temperature" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
77	Err-skin	Operation	Key "control skin temperature" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
78	Err-skin	Operation	Key ,,Check 36°C" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
79	Err-O2	Operation	Key "plus 0_2 concentration" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**

Error no.	Results in	When set	Description, cause and remedy
80	Err-O2	Operation	Key "minus 0_2 concentration" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
81	Err-O2 or no effect	Operation	Key "control 0_2" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
82	No effect	Operation	Key ">40% by vol." sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
83	No effect	Operation	Key "cal. 0_2" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
84	Err-humidity	Operation	Key "plus humidity" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
85	Err-humidity	Operation	Key "minus humidity" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
86	Err-humidity or no effect	Operation	Key "control humidity" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**

Error no.	Results in	When set	Description, cause and remedy
87	No effect	Operation	Timekeeper RAM defective Fault detection: Flag for flat battery in timekeeper RAM on CPU PCB set. Remedy: Renew timekeeper RAM 18 28 142 on CPU PCB, see 8.2.5 back
88	Sensor fault	Operation	Short circuit skin temperature sensor 2 Fault detection: Voltage of skin temperature amplifier too high. Possible faults: - Sensor defective - PCB Analog with ThermoMonitoring defective - Short circuit in cable between side wall to Analog PCB. Troubleshooting: - Renew sensor - Check Analog with ThermoMonitoring back

Error no.	Results in	When set	Description, cause and remedy
89	Sensor fault	Operation	Skin temperature sensor 2 defective Fault detection: Voltage of skin temperature amplifier too low. Possible faults: - Sensor not connected - Break in cable in sensor or in cable between side wall to Analog PCB - Analog PCB with ThermoMonitoring defective Troubleshooting: - Renew Sensor - Is the temperature value indicated on pressing key "Check 36°C"? - Check Analog PCB with ThermoMonitoring **back**
90	Err-skin	Operation	Key "Symbol for foot" sticking Fault detection, possible faults and remedy: See error 68 (**Err68**) **back**
91	INOP	Cold start (Boot)	Monoflop on CPU PCB defective Fault detection: Monoflop on CPU PCB is defective or not present. Possible faults: - CPU PCB defective - Wrong PCB CPU 82 90 571 - 00 without monoflops, see chapter 8.2.5. **back**

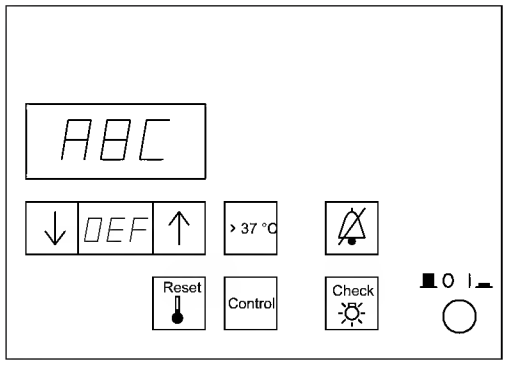
Error no.	Results in	When set	Description, cause and remedy
92	Err-skin	Operation	Switch over between skin temperature sensor 1 and 2 defective Possible fault: Analog PCB with ThermoMonitoring defective back
93	INOP	Cold start (Boot)	Monoflop on PCB CPU defective See error 91 (Err91) back

6.3 Service mode

6.3.1 How to use service mode

Service mode call-up

- Device in operation and self-test over
- Simultaneously press keys "silence" and "down arrow key" for air temperature setting and in doing so switch on device.



- Keep both keys continuously pressed for approx. 6 seconds.
- Service mode number is flashed up in right digit of air temperature set point display.
- Key "up arrow key" for air temperature setting gives access to next mode.
- Service mode is terminated by pressing the key "check lamps"

6.3.2 Service mode

Click on mode number for viewing:

Mode 0 - software version

Mode 1 - hours of operation

Mode 2 - counter for key "check lamps"

Mode 3 - counter for key "check 36°C"

Mode 4 - testing of micro switches in climate sensor

Mode 5 - measured value of overtemperature sensor

Mode 6 - measured value of air temperature sensor

Mode 7 - measured value of O_2 sensor A

Mode 8 - measured value of O_2 sensor B

Mode 9 - measured value of humidity sensor

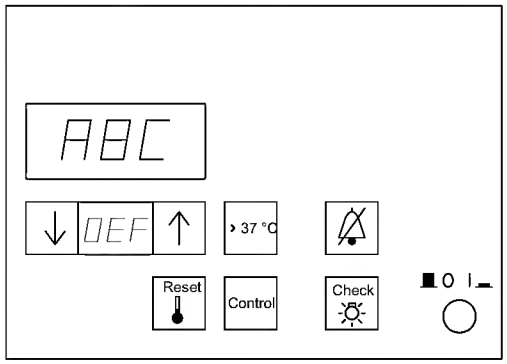
Mode A - AD-Converter reference channel

Mode b - measured value of skin temperature sensor 1

Mode c - measured value of skin temperature sensor 2

6.3.2.1 Mode 0 - software version

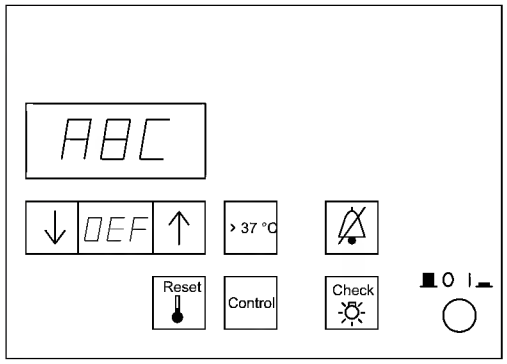
The mode number is flashed up in " F ":



The software version number is AB.CD (e.g. 20.01) back

6.3.2.2 Mode 1 - hours of operation

The mode number is flashed up in " F ":

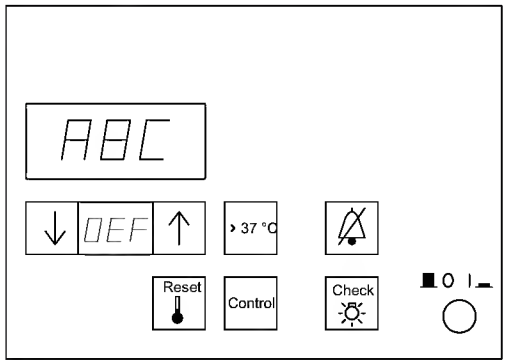


Hours of operation ABCDE in hours. back

Setting elapsed-time meter:
Pressing the key "silence" selects the variable digit in each case (causes it to flash). Each time the key "> 37°C" is pressed the value of the digit is incremented by 1. Whenever the electronics module or the CPU PCB is replaced, the content of the elapsed-time meter must be transferred to the new component.

6.3.2.3 Mode 2 - counter for key "check lamps"

The mode number is flashed up in " F ":

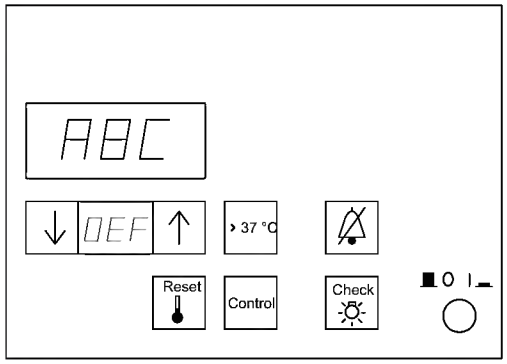


Number of times key pressed = ABCDE back

Setting counter:
Pressing the key "silence" selects the variable digit in each case (causes it to flash). Each time the key "> 37°C" is pressed the value of the digit is incremented by 1. Whenever the electronics module or the CPU PCB is replaced, the content of the counter must be transferred to the new component.

6.3.2.4 Mode 3 - counter for key "check 36°C"

The mode number is flashed up in " F ":

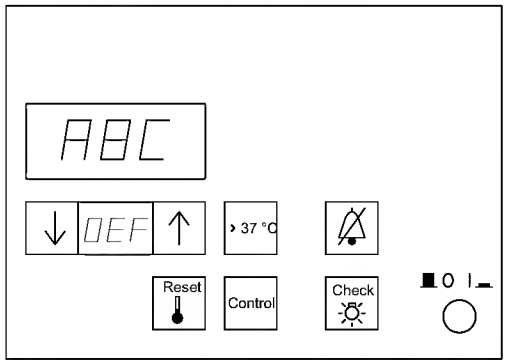


Number of times key pressed = ABCDE back

Setting counter:
Pressing the key "silence" selects the variable digit in each case (causes it to flash). Each time the key "> 37°C" is pressed the value of the digit is incremented by 1. Whenever the electronics module or the CPU PCB is replaced, the content of the counter must be transferred to the new component.

6.3.2.5 Mode 4 - testing of micro switches in climate sensor

The mode number is flashed up in " F ":

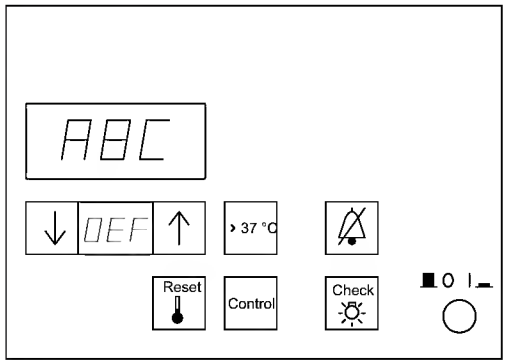


B = Position of climate sensor => 1 = swiveled in
2 = half swiveled out
3 = swiveled out
4 = removed from hinge

back

6.3.2.6 Mode 5 - measured value of overtemperature sensor

The mode number is flashed up in " F ":

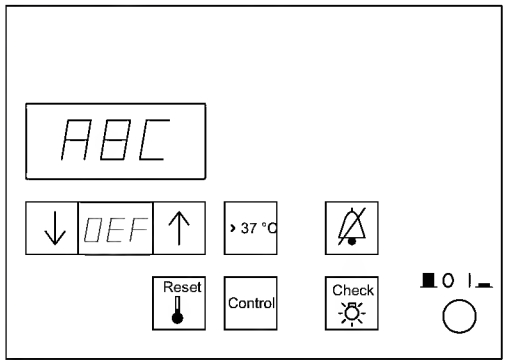


Measured value of overtemperature sensor = AB.C in °C

back

6.3.2.7 Mode 6 - measured value of air temperature sensor

The mode number is flashed up in " F ":

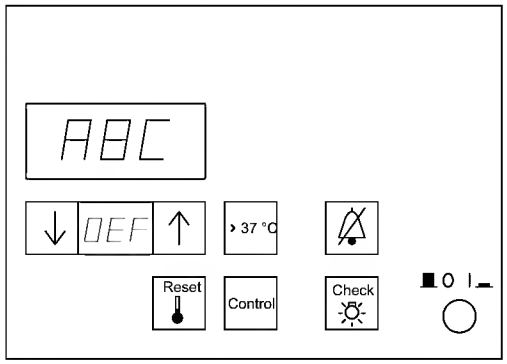


Measured value of air temperature sensor = AB.C in °C back

Note: The deviation between overtemperature and air temperature sensor must not exceed 0.3°C.

6.3.2.8 Mode 7 - measured value of O_2 sensor A

The mode number is flashed up in " F ":

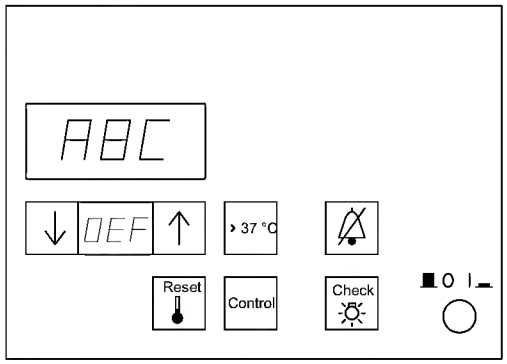


Decimal measured value = ABC back

This value must be between 306 (approx. 9.5 mV) and
812 (approx. 25 mV).
The 0_2 sensor A is the outer capsule in the climate sensor.

6.3.2.9 Mode 8 - measured value of O_2 sensor B

The mode number is flashed up in " F ":

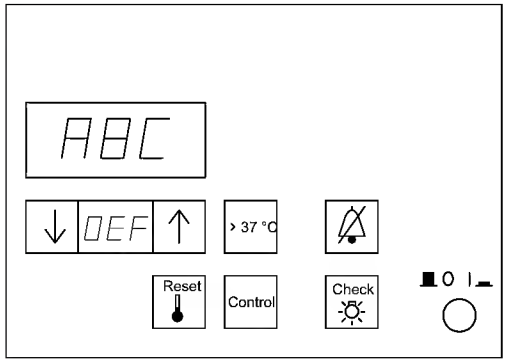


Decimal measured value = ABC **back**

This value must be between 306 (approx. 9.5 mV) and
812 (approx. 25 mV).
The 0_2 sensor B is the inner capsule in the climate sensor.

6.3.2.10 Mode 9 - measured value of humidity sensor

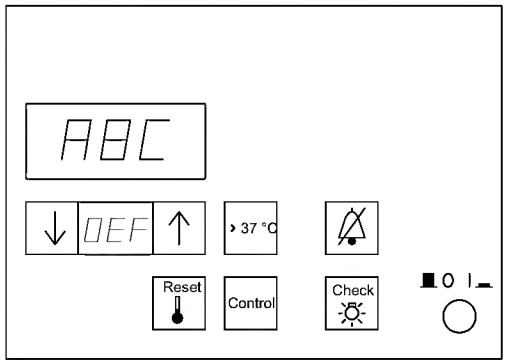
The mode number is flashed up in " F ":



Measured humidity value = AB.C in % relative humidity **back**

6.3.2.11 Mode A - AD-Converter reference channel

The mode number is flashed up in " F ":

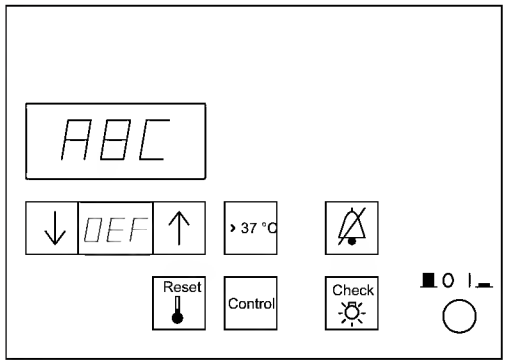


AD-Converter test channel voltage in mV = ABCD back

This value must be between 4100 and 4700.
Calibration: See repair instructions Analog PCB.

6.3.2.12 Mode b - measured value of skin temperature sensor 1

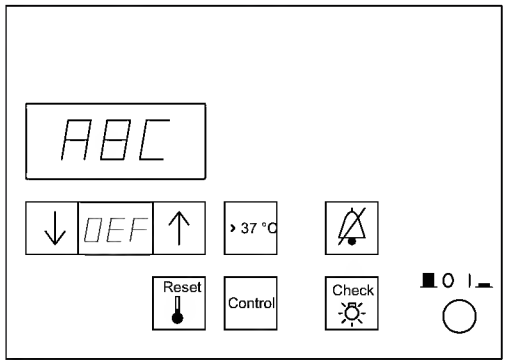
The mode number is flashed up in " F ":



Measured value of skin temperature sensor 1 = AB.C in °C back

6.3.2.13 Mode c - measured value of skin temperature sensor 2

The mode number is flashed up in " F ":



Measured value of skin temperature sensor 2 = AB.C in °C back

6.3.3 "10-min-test" with tighter tolerances

It is possible at any point in service mode to initiate a "10-min-test" with tighter tolerances by pressing the key "reset over temperature". There must always be a waiting time of 1 second between the tests. If the device switches to INOP or ERROR, the appropriate cause must be eliminated as otherwise this fault could occur during operation.